Attorney's Docket No. 032842-014

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Ullas Gargi et al.

Application No.: 09/904,627

Filed: July 16, 2001

For: HIERARCHICAL IMAGE FEATURE-BASED VISUALIZATION

Group Art Unit: 2672

Examiner: JIN CHENG WANG

Appeal No.:

APPEAL BRIEF

REVISED

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. Real Party in Interest

The real party in interest with respect to this application is Hewlett-Packard.

II. Related Appeals and Interferences

There are no other prior and pending appeals, interferences or judicial proceedings known to the Appellants, the Appellants' legal representative, or the assignee which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

III. Status of Claims

The claims currently pending in this application are Claims 1-20, all of which stand finally rejected. Claims 1-20 are being appealed.

IV. Status of Amendments

No amendments were filed after final rejection.

V Summary of Claimed Subject Matter

A method of visualizing and retrieving a data file from a set of data files, e.g., as illustrated in Fig. 1, is disclosed. Such a method is encompassed by claim 1 and includes the Fig. 1 steps of displaying, in block 110, a plurality of images representing corresponding data files on a display device using a first distance metric between each data file (e.g., page 5, paragraph [0011], lines 20-22), redisplaying, in block 120, a portion of the images on the display device using a refined distance metric (e.g., page 6, paragraph [0011], lines 1-3), and performing, in

block 140, at least one of retrieving, marking, and selecting at least one desired data file (e.g., page 6, paragraph [0011], lines 3-13).

As discussed on specification page 16, lines 6-8, as the level of redisplay increases (e.g., the number of iterative redisplay operations is increased), the percentage of data used to calculate the distance metric increases (that is, "refining the distance metric"). Appellants' specification describes examples of how a more refined calculation is performed to redisplay a portion of the images that were initially displayed using a first distance metric between each data file (see, for example, the color histogram example of paragraph [0032]). Figs. 2A-2E illustrate a graphical representation of a display of images (Fig. 2a) using a first distance metric between each data file and an interactive selection by the user of an area 202 within the displayed images. Fig. 2B shows a redisplayed portion of the images within area 202, produced using a refined distance metric.

Claim 17 is directed to a method of interactively retrieving a data file from a set of data files in real time, e.g., as illustrated in Fig. 3. The claim 17 method encompasses the Fig. 3 steps of displaying a plurality of images in block 310, each image corresponding to a data file, on a display device using a first distance metric between each data file, interactively selecting in block 320, by a user, a portion of the images, redisplaying in block 330 the portion of the images in real time on the display device using a refined distance metric, and retrieving a desired data file in block 350 (e.g., paragraphs [0018] and [0019]).

Thus, like claim 1, claim 17 recites performing a redisplay operation on images, originally displayed based on a distance metric between each data file using a "redefined distance metric." In addition, claim, 17 recites that this occurs in real

time, and that it is performed interactively by having the user actually select a portion of the images.

VI. The Issues

The final Office Action presents the following issues for a review on this appeal:

A. Whether claims 1-7, 11, 12 and 16-19 are anticipated by U.S. Patent No. 6,240,423 (Hirata);

B. Whether claims 8, 13 and 14 are unpatentable over the Hirata patent, and further in view of U.S. Patent 6,584,221 (Moghaddam et al.);

C. Whether claims 9, 10 and 20 are unpatentable over the Hirata patent, and further in view of U.S. Patent 6,121,969 (Jain et al.); and

D. Whether claim 15 is unpatentable over the Hirata patent, and further in view of U.S. Patent 5,528,259 (Bates et al.).

VII. Argument

A. The Hirata Patent Does Not Disclose Each And Every Element Recited In The Claims.

The rejection based on the Hirata patent cannot stand because the Hirata patent fails to either expressly or inherently disclose a number of features recited in independent claims 1 and 17. Additionally, the dependent claims recite combinations of features defining combinations of separately patentable subject matter not disclosed in the Hirata patent. To anticipate the claimed invention, the cited document must disclose each and every feature set forth in the claimed combination of features (see, MPEP § 2131).

Independent claims 1 and 17 recite, among other features, redisplaying a portion of the images on the display device using a refined distance metric. In contrast, the Hirata patent is directed to a query based image matching system, wherein images are displayed only a single time per query. Using this method, the Hirata patent displays the results of a database query based upon results of a combined region based image matching and a boundary based image matching.

With respect to claim 1, the Examiner asserts on pages 2 and 3 (paragraph 3) of the final Office Action that Hirata patent discloses:

> Displaying a plurality of images representing corresponding data files on a display device using a first distance metric (Calculating a first similarity between a query image and images in the database using a region-based matching to produce a first set of similar images. Images being retrieved in order based upon the distance between the query image and the result candidate images, column 6) *between each data file* (e.g., Based on the mutual similarities between the images, retrieval results of the candidate images are sorted. The images which are similar to each other are assumed to be under one group and are re-ordered based on the similarity and users can specify the forms of the output for display; figures 1-11; column 6-9);
>
> Redisplaying a portion of the images on the display device using a refined distance metric (e.g., Hirata teaches using a distance metric such as a second similarity to retrieve images based on the set of similar images retrieved using a first similarity. The second similarity is now a "refined" distance metric because it refines the search for images. The second similarity of Hirata thus meets the claim limitation of a "refined distance metric." Here, a refined set of similar images is produced from the first set of similar images produced using a first distance metric, figures. 9, 11 and 12; column 6-9); and
>
> Performing at least one of retrieving, marking and selecting at least one desired data file (Hirata teaches retrieving and selecting at least one desired data file; see, figures 1-11; column 6-9). (Underlining and italics in original.)

With respect to claim 17, on page 6 of the Office Action, in numbered paragraph 4, the Examiner asserts that the Hirata patent discloses clustering image data files using a distance metric such as a first similarity, with reference to Figures 1-11 and at column 6-9. The Examiner also asserts that the Hirata patent discloses:

> Interactively selecting, by a user, a portion of the images (e.g., a user [specifies] the regions of the images; e.g., the region division of figure 3; figures 1-11; column 6-9);
>
> Redisplaying the portion of the images in real time on the display device using a redefined distance metric (e.g., Hirata teaches using a distance metric such as a second similarity to retrieve images based on the set of similar images retrieved using a first similarity. The second similarity is now a "refined" distance metric because it refines the search for images. The second similarity of Hirata thus meets the claim limitation of "a refined distance metric." Here, a refined set of similar images is produced from the first set of similar images produced using a first distance metric. Re-order based on the similarity among the candidate images of figure 9 or 2nd stage image matching based on boundary of figure 11 and grouping and re-ordering is based on the similarity among candidates using the refined distance metric of figure 11; figures 1-11; column 4); and
>
> Retrieving a desired data file (retrieved data file is displayed on a display device; figures 1-11; column 4).

The foregoing rejections are respectfully traversed, as the Hirata patent, considered alone, or in combination with the various secondary references relied upon by the Examiner, fails to teach or suggest all features set forth in Appellants' independent claims 1 and 17.

The present application discloses a multi-media database and classification system, which can, for example, provide for automatic classification and retrieval of multimedia files based on features of the multimedia files. Figure 1 shows an exemplary method for visualizing and retrieving data files in accordance with an

exemplary embodiment of the present invention. In step 110, a plurality of images representing data files on a display device are displayed using a first (i.e., coarse) distance metric. The distance metric represents a distance between each data file. In step 120, a portion of the images can be **redisplayed** on the display device using a **refined distance metric**. As described on specification page 6 beginning with line 4, the distance metric can be refined at each of plural redisplays until a desired data file is found or a maximum refined distance metric is reached. In step 140, a desired data file can be retrieved, and/or can be marked or selected.

Figures 2A-2E show a graphical representation of displays generated in accordance with exemplary embodiments, where each portion of the images redisplayed can be graphically selected by a user. Figure 2A is a screen capture of an exemplary display showing a first level of images representing data files on a two-dimensional display. A first, coarse, distance metric can be calculated, and allows the user to receive useful information about the organization of images on the display. Based on perceived properties of a desired image, a user can select an area 202 of the screen where a desired image most likely resides. Figure 2B shows a portion of images redisplayed as selected by area 202. Here the distance metric has been recalculated using more of the image information than was used in the first distance calculation.

The redisplay process can be repeated, as represented by Figures 2C and 2D. Distance metrics between images are again recalculated using more image feature data than previously used with respect to Figure 2B. Following the redisplay based on recalculated distance metrics, a desired data file (e.g., image 240) is identifiable and can be selected and retrieved as shown in Figure 2E. Figure 3

shows another exemplary method which can be implemented in accordance with the present invention, and Figure 4 shows a flowchart for performing a coarse to fine distance calculation.

The foregoing features are broadly encompassed by independent claims 1 and 17. In contrast to using query based image retrieval, exemplary embodiments of the present invention display images using a first distance metric **between each data file**, and provide for **redisplaying** a portion of the images using a **refined distance metric**. The claim 1 method includes a step of displaying a plurality of images representing corresponding data files on a display device using a first distance metric **between each data file**. Claim 1 also recites **redisplaying** a portion of the images on the display device using a **refined distance metric**. Claim 17 is directed to a method of interactively retrieving a data file from a set of data files in real time, and includes features similar to those mentioned with respect to claim 1.

The foregoing features are neither taught nor suggested by the Hirata patent considered individually or in combination with the various secondary documents relied upon by the Examiner.

In contrast to the presently claimed invention, the Hirata patent is directed to a method for querying a database of images and displaying the results in a manner as illustrated, for example, in Figure 10B of the Hirata patent. The results of the query are based upon a combination of region based image matching and boundary based image matching as described, for example, at column 2, lines 48-65. In the Hirata patent's query-based system, an initial query is submitted and a set of results is clustered. The clustering of the search results is performed using a distance between each file and a distance to the query, as discussed at column 6, lines 37-

41. In all cases, clustering involves, at least in part, using the distance to a query (see the Hirata patent's Figures 8, 9 and 10). The Hirata patent is not directed to redisplaying a portion of displayed images using a refined distance metric. In contrast to Appellants' claimed use of a refined distance metric to redisplay a portion of displayed images, Hirata teaches applying a new distance metric to all images during each image matching operation.

Thus, in contrast to the method disclosed and recited in Appellants' independent claims 1 and 17, the Hirata patent fails to teach or suggest using a refined distance metric to redisplay a portion of displayed images.

In addition, the Hirata patent fails to teach or suggest the claim 17 feature of interactive user selection for selecting a subset of images to be displayed. Rather, the query based system of the Hirata patent groups all images, and only creates new groupings based on a new query. The Hirata patent does not teach or suggest applying a refined distance metric in a second stage of image matching to redisplay a portion of displayed images.

In rejecting claim 17 on page 6 of the Office Action, the Examiner refers to the region division in Figure 3 of the Hirata patent as illustrating user specified regions. However, Hirata does not teach or suggest that a refined distance metric, as presently claimed, is used to redisplay the images of any defined region (see Hirata at column 4, line 10 to column 5, line 13). As such, the Hirata patent fails to teach or suggest the user interactive selection feature of Appellants' claim 17.

Thus, the Hirata patent fails to teach or suggest the features recited in Appellants' independent claims 1 and 17.

As such, independent claims 1 and 17 are allowable. All of the other claims depend from independent claims 1 and 17 and recite additional advantageous features which further distinguish over the documents relied upon by the Examiner. Hence, for these additional reasons, the Hirata patent fails to disclose each and every limitation set forth in independent claims 1 and 17, and hence also in claims depending from these independent claims.

For at least these reasons, the rejection of independent claims 1 and 17 is improper. Accordingly, the rejection should be reversed.

B. The Hirata Patent And The Secondary References, Fail To Teach Or Suggest All Features Of Claims 1 and 17

The Hirata patent, considered alone, or in combination with the various secondary references relied upon by the Examiner, fails to teach or suggest all features set forth in Appellants' independent claims 1 and 17. Specifically, the Hirata patent fails to teach or suggest at least the above argued features of redisplaying a portion of the images on the display device using a refined distance metric recited in Appellants' independent claims 1 and 17. In contrast, the Hirata patent is directed to a query based image matching system, wherein images are displayed only a single time per query.

The patents to Moghaddam et al., Jain et al. and Bates et al., as relied upon by the Examiner, fail to overcome the noted deficiencies of the Hirata patent. For example, the Moghaddarm et al. patent is directed to a method for representing an image in an image retrieval database, further disclosing separation and filtering of given images to extract color and texture features; the Jain et al. patent is directed to

a visual navigation in perceptual databases, the given images being ranked and correlated to allow perception of selected images and the relationship between the images; and the Bates et al. patent discloses multi-dimensional scrolling of overlapping data collections which are displayed in multiple layers. The patents to Moghaddam et al., Jain et al. and Bates et al., as relied upon by the Examiner, do not disclose or suggest at least the above argued features of redisplaying a portion of the images on the display device using a refined distance metric recited in Appellants' independent claims 1 and 17.

As such, independent claims 1 and 17 are allowable. Claims 8-10 and 13-15 depend from claim 1, and claim 20 depends from claim 17, and recite additional advantageous features which further distinguish over the documents relied upon by the Examiner.

Claims 8, 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Hirata patent, and further in view of U.S. Patent 6,584,221 (Moghaddam et al.); claims 9, 10 and 20 stand rejected under 35 U.S.C. § 102(e) as being unpatentable over the Hirata patent, and further in view of U.S. Patent 6,121,969 (Jain et al.); and claim 15 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the Hirata patent, and further in view of U.S. Patent 5,528,259 (Bates et al.).

For at least these reasons, the Hirata patent does not disclose or suggest each and every element of claims 8-10, 13-15 and 20, and the patents to Moghaddam et al., Jain et al. and Bates et al. do not make up for the deficiencies of the Hirata patent. Accordingly, the rejection should be reversed.

C. The Examiner's Assertions In The Advisory Action Are Traversed Because The Hirata Patent Fails To Disclose Or Suggest Each And Every Element Recited In The Claims.

The Examiner responds to these points at page 2 of the Advisory Action:

> 1) Applicant argues in essence that the Hirata patent is not directed to redisplaying a portion of displayed images using a refined distance metric. In response, Hirata teaches in column 7 that the step of image matching based on boundary is applied to the results of image matching based on region and the step of grouping and re-ordering based on similarity among result candidates is applied to the results of the image matching based on boundary. Moreover, in column 14 or in the claims 37-39, Hirata clearly teaches displaying the second set of images grouped by the clusters on the display and REDISPLAYING RE-ORDERED SECOND SET of IMAGES ON THE DISPLAY and therefore at least two steps of displaying is involved in the process.
>
> 2) Moreover, Hirata teaches in column 6 a [similarly] matching among the candidate images resulting from the region-based and boundary-based matching. Not only users can select regions for the image matching or querying, but also users can specify other parameters such as the threshold values to determine how the images are [categorized] into groups and this categorization is used to REDUCE the number of images to be displayed.
>
> 3) Hirata discloses in column 7 that the number of results (the number of the input images for the step (3) as taught in Hirata) to be processed in the step of image matching based on boundary and the step of grouping and re-ordering based on similarity among result candidate images can be CONTROLLED BY THE USER, and such a selection further limits the number of the candidate images to be re-displayed in step (3).

4) The displaying and re-displaying of the resulting candidate images are [interactive] because users can select the number of the candidate images to be processed and the threshold values for the clustering of the candidate images, thereby determining how the portion of candidate images (which is less than the candidate images from step (1) and (2) as taught in column 7 of Hirata) are arranged on the display. By selecting the number of the candidate images in the step of grouping and re-ordering based on similarity among the result candidates and the selection of the representative image in each cluster, the resulting images being redisplayed is less than the set of the resulting candidates from steps (1) and (2). Hirata thus teaches redisplaying a portion of displayed images selected in the previous step of the boundary image matching using a mutual similarity measure. Users' selection of the candidate images from the steps (1) and (2) produces a refined set of the candidate images for the step (3). Finally, it is noted that the mutual similarity as calculated in Hirata's column 9, lines 1— the claim limitation of a distance measure.

5) From the teaching of column 6-7 and 14, it is concluded that Hirata at least discloses two separate steps of displaying the candidate images wherein a lesser number of the clustered candidate images can be re-ordered and re-displayed. Hirata further teaches interactive user selection for selecting a subset of images to be re-ordered and re-displayed based on the mutual similarity.

The foregoing assertions by the Examiner are respectfully traversed, as the Hirata patent, considered alone, or in combination with the various secondary references relied upon by the Examiner, fails to teach or suggest all features set forth in Appellants' independent claims 1 and 17. The image matching based on boundary, as taught by the Hirata patent, does not redisplay a portion of the images

as claimed, and does not suggest redisplay of a portion of the images first displayed. Rather, the first and second similarity calculations disclosed by the Hirata patent are a mere sequence of calculations in a method for querying a database.

Moreover, a similarity matching among candidate images resulting from the Hirata patent's region-based and boundary-based matching does not produce a redisplay of a portion of the already displayed images for retrieving. The Hirata patent does not disclose a first visual display of a plurality of images, and redisplaying a portion of the first displayed images, the portion being in reference to the first display.

The Examiner asserts that the displaying and re-displaying of resulting candidate images are interactive because users can select the number of the candidate images. However, the selection criteria are not based upon visual inspection of the first display and defining a portion of the first display for redisplay. The Hirata patent's clustering does not cure the noted deficiencies, because the clustering is merely a process in the second similarity calculation, but does not teach or suggest at least the claimed feature of redisplaying a portion of the first displayed images. The Hirata patent does not teach or suggest at least these salient claim features.

For at least the reasons discussed above, it thus respectfully submitted that the claims are in condition for allowance.

VIII. Conclusion

For the reasons discussed above, appellants respectfully submit that the Examiner's decision finally rejecting Claims 1-20 should be reversed.

IV Evidence Appendix

See attached Evidence Appendix for copies of evidence relied upon by Appellant.

NONE

X Related Proceedings Appendix

See attached Related Proceedings Appendix for copies of decisions identified in Section II, supra.

NONE

Respectfully submitted,

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VIII. CLAIMS APPENDIX

The Appealed Claims

Claim 1. A method of visualizing and retrieving a data file from a set of data files comprising:

displaying a plurality of images representing corresponding data files on a display device using a first distance metric between each data file;

redisplaying a portion of the images on the display device using a refined distance metric; and

performing at least one of retrieving, marking, and selecting at least one desired data file.

Claim 2. The method of claim 1, further comprising:

repeating the redisplaying step until a desired data file is identifiable.

Claim 3. The method of claim 1, wherein the first distance metric is calculated by a method comprising:

computing a feature vector for each data file; and

calculating the first distance metric between each data file using a first subset of data contained in the feature vector.

Claim 4. The method of claim 3, wherein the refined distance metric is calculated by a method comprising:

calculating a second distance metric between each data file using a second subset of data contained in the feature vector which is greater than the first subset.

Claim 5. The method of claim 4, wherein the step of computing the feature vector comprises:

computing the feature vector for each data file before starting the method;

storing the feature vector for each data file; and

accessing the feature vector for each data file.

Claim 6. The method of claim 4, wherein each feature vector has a length of at least eight.

Claim 7. The method of claim 4, wherein the feature vector includes at least one of a color feature and a texture feature.

Claim 8. The method of claim 4, wherein the feature vector includes at least one of a color histogram, color moment, color coherence histogram,

Multiresolution Simultaneous Autoregressive (MRSAR) Model, coarseness, and directionality.

Claim 9. The method of claim 1, wherein the first distance metrics are mapped into an N-dimensional space using FastMap for displaying and wherein the refined distance metrics are mapped into an N-dimensional space using FastMap for redisplaying.

Claim 10. The method of claim 9, wherein N is two or three.

Claim 11. The method of claim 1, wherein the data files are image files.

Claim 12. The method of claim 1, wherein the data files are video files.

Claim 13. The method of claim 1, further comprising:

establishing a fixed scale that spans a maximum distance between the plurality of data files; and

indicating a relative position on the fixed scale for the redisplay of the portion of the images, thereby providing the user with a reference frame.

Claim 14. The method of claim 1, wherein the fixed scale is at least one of a linear scale, a logarithmic scale, and a hyperbolic scale.

Claim 15. The method of claim 1, further comprising:

providing a display depth indication that represents an amount of overlapping of images on the display; and

scrolling to view images that were previously not viewable due to overlapping of the images.

Claim 16. The method of claim 1, wherein the portion of the images redisplayed is graphically selected by the user.

Claim 17. A method of interactively retrieving a data file from a set of data files in real time comprising:

displaying a plurality of images, each image corresponding to a data file, on a display device using a first distance metric between each data file;

interactively selecting, by a user, a portion of the images;

redisplaying the portion of the images in real time on the display device using a refined distance metric; and

retrieving a desired data file.

Claim 18. The method of claim 17, wherein the first distance metric is calculated by a method comprising:

computing a feature vector for each data file; and

calculating the first distance metric between each data file using a first subset of data contained in the feature vector.

Claim 19. The method of claim 18, wherein the refined distance metric is calculated by a method comprising:

calculating a second distance metric between each data file using a second subset of data contained in the feature vector which is greater than the first subset.

Claim 20. The method of claim 19, wherein the first distance metrics are mapped into a N-dimensional space using FastMap for displaying and second distance metrics are mapped into a N-dimensional space using FastMap for redisplaying.

IX. EVIDENCE APPENDIX

NONE

X. RELATED PROCEEDINGS APPENDIX

NONE